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A Consideration of Some of the Affections of Tendon-Sheaths and Bursæ, and their Relations to Injuries and Diseases of the Joints

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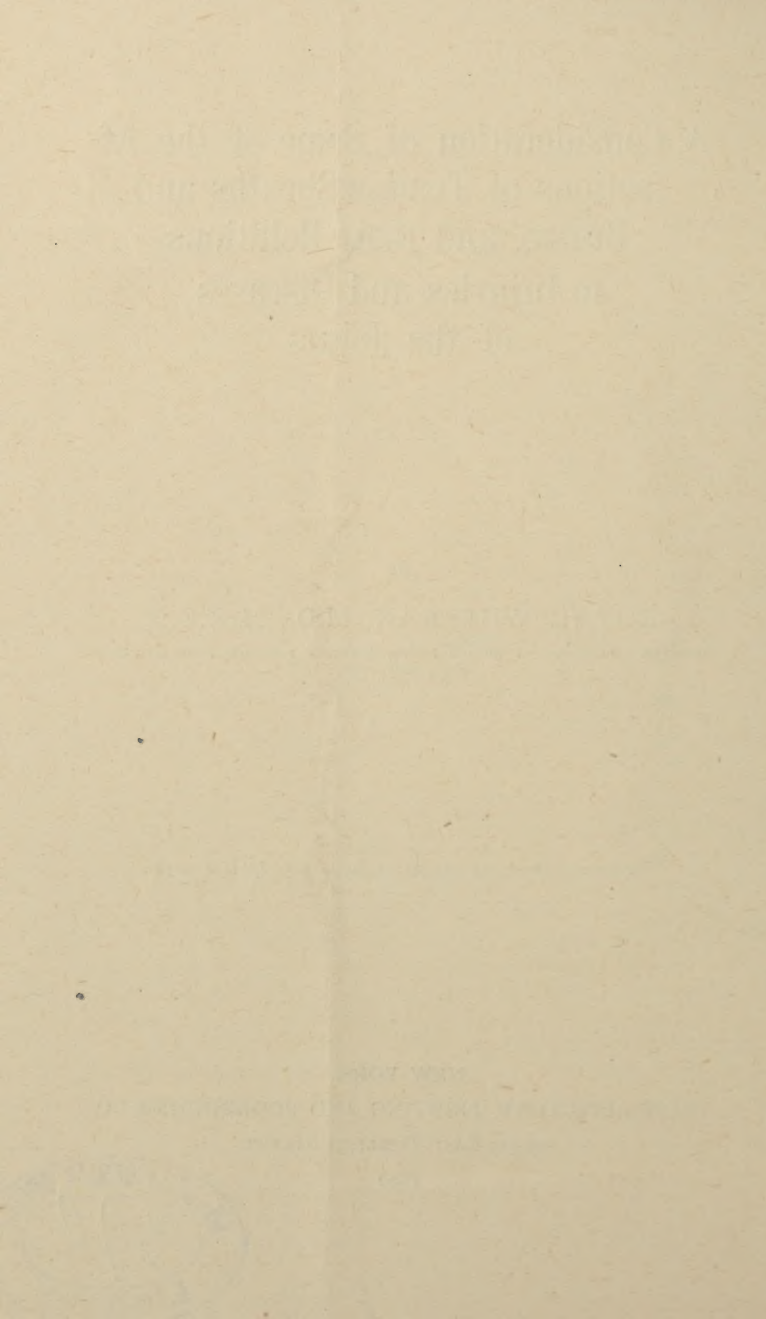
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A CONSIDERATION OF SOME OF THE AFFECTIONS OF TENDON-SHEATHS AND BURSÆ, AND THEIR RELATIONS TO INJURIES AND DISEASES OF THE JOINTS.¹

I HAD intended to consider somewhat in detail primary diseases of bursæ and tendon-sheaths, but a reconsideration of the cases whose treatment had induced me to choose this subject for discussion showed that, in the great majority, affections of the tendon-sheaths were secondary to injury in which a joint was also involved, while the cases of primary disease were too few for the purpose of a paper designed to be clinical in character. I propose, therefore, to call your attention to some of the anatomical relations of tendon-sheaths, and to consider their affections with reference chiefly to their importance in the treatment of joint injuries, not limiting myself as strictly as the title of the paper would imply.

Bursæ and tendon-sheaths are practically identical in structure and function. A bursa is a closed sac upon which a tendon rests, which covers a bony prominence or lies between two tendons; a synovial sheath is a bursa which surrounds more or less completely a tendon.

The majority of bursæ and tendon sheaths are perfectly formed at birth, undergoing certain changes with the age and occupation of the individual, or developing *de novo* from the connective tissue, as occasion requires.

In structure they are composed of an outer layer of fibrous and elastic tissue, more or less adherent to the

¹ Read before the Orthopædic Section of the Academy of Medicine, December 18, 1891.

surrounding parts, and an inner layer approximating that of serous membrane, differing in the character of some of the cells, which are in places superimposed one on another, secreting mucin, which gives the contents of the sac its peculiar character.¹

Normally there is no excess of fluid in the sac, its two layers being in contact. A tendon-sheath partially or completely surrounds the tendon, its inner layer being closely adherent to it; this sheath is not like a tube through which the tendon passes, as it is often described, but is rather like a sac folded about it, an interval remaining where the two outer layers meet, for the passage of vessels. This has been called the meso-tendon, from its analogy to the mesentery of the intestines.²

Not all the important tendons are provided with sheaths, however; those which have none are simply surrounded by loose connective tissue, showing that fully-developed sheaths are not essential to the health or functional uses of the tendons. The statement, therefore, that the sheath stands in the same relation to the tendon as does the periosteum to bone, is an exaggerated one.

The tendon-sheaths are, with few exceptions, grouped about the wrist, hand, and ankle. I shall briefly outline their arrangement, referring those who may desire a more complete knowledge of the subject to the writings of Rosthorn,³ Garré,⁴ Schwartz,⁵ Schüller,⁶ and others.

At birth each finger has upon its flexor aspect a tendon-sheath reaching from the head of the metacarpal bone to about the middle of the second phalanx. In the wrist and palm there are two separate synovial sacs, each beginning at about the level of the wrist-joint, the one on the radial, the other on the ulnar aspect, lying in close contact with the carpal ligaments, in the palm being more

¹ Soubbotine : Archives de Physiologie Normale et Pathologique, vol. vii, p. 532.

² Schwartz : Art. Synoviales, Nouv. Dict. de Méd. et de Chir.

³ Arch. für klin. Chir., vol. xxxiv., 1887.

⁴ Beiträge zur klin. Chir., Bd. 7, p. 293.

⁵ Loc. cit.

⁶ Deutsche Medizinische Wochenschrift, July 20, 1878.

superficial and adherent to the palmar fascia. The radial sac envelops the two tendons of the thumb only; the ulnar the two tendons of the little finger and partially those of the ring-finger. The other tendons have, as a rule, no sheaths. At about the first year the radial sac joins that of the thumb and the ulnar that of the fifth finger so that free communication is established with the synovial membrane of the wrist and palm—an anatomical peculiarity which is often demonstrated clinically by the rapid spread of peripheral inflammation to the palm, when either of these two digits is implicated. There are in addition at the annular ligament two small bursæ for the superficial tendons, the palmaris longus and the flexor carpi radialis. It is not necessary to mention in detail the six small sheaths on the back of the wrist, the most important is that of the common extensor of the fingers, beginning at the wrist-joint and extending about one-third of the distance up the metacarpal bones. These sheaths being more superficial, and for the most part lying directly on the bones, are more prone to injury in sprains and fractures at the wrist.

At the ankle-joint all the tendons are provided with sheaths; on the front of the foot are three—the sheath of the tibialis anticus which extends from just above the extremity of the malleolus to the scaphoid bone; that of the extensor longus pollicis, from the same level to the head of the first metatarsal; and the common sheath for the extensor communis digitorum, extending from a point about two inches above the malleoli to about one inch below the annular ligament. Behind the internal malleolus are the common sheaths of the tibialis posticus and flexor longus digitorum, beginning one-third of an inch above the point of the malleoli and extending to the astragalo-scaphoid junction, and that of the flexor longus pollicis of about the same extent.

Behind the outer malleolus is the sheath of the two peronei, beginning one half inch above the malleolus, dividing into two portions for the two tendons, and ending just behind the tuberosity of the fifth metatarsal bone.

Although the normal boundaries of these sacs are about as described, when diseased they enlarge and extend indefinitely in either direction.

Primary affections of tendon sheaths may be divided into acute and chronic, the most common variety being the dry, crepitating form, from over-use or injury, most often seen about the extensors of the thumb, although in many of these cases, as Larger has shown,¹ the disease is of the ante-brachial bursa, and not in the sheaths of the tendons themselves. Less frequent is a subacute inflammation with slight swelling and local pain about the affected tendon. An acute inflammation with great effusion has been described by Brunon,² but there are few supporting cases.

A more chronic or plastic inflammation, caused by repeated injury, or after rheumatic affections, or from peripheral irritation or suppuration, which causes adhesions between the tendons and their sheaths with resulting functional disability, was first described in detail by Goselin.³ This form is of particular interest to us, who are considering secondary affections of tendons in relation to injuries of the joints. The treatment of these acute and subacute inflammations of tendon-sheaths is, as is well known, absolute functional rest, local compression, massage, and stimulation.

Chronic disease of tendon-sheaths, characterized by slow enlargement without adequate cause, increasing in size with progressive functional weakness and deformity, most often affecting the palmar sheaths, is now considered identical with fungous disease of the sheaths, and tuberculous in character,⁴ for which there is but one treatment, early and complete excision. I have, at a previous meeting of the Society, shown one of these cases—an enlargement of the sheath of the common extensor of the toes, a large tumor constricted by the an-

¹ *Revue de Chir.*, March 10, 1882.

² *Gazette des Hôp.*, 1883, p. 1177.

³ Schwartz: *Loc. cit.*

⁴ Garré: *Loc. cit.* Golding-Bird: *Trans. London Path. Soc.*, vol. xl., p. 244. Berger: *Deutsche Zeit. für Chir.*, vol. xxi., p. 335. Nicaise, Poulet et Vaillard: *Revue de Chir.*, 1885, p. 609.

nular ligament and bulging in a characteristic manner at either end. The sac was removed and found to be almost completely filled with rice-bodies. To my surprise microscopic examination showed no sign of tubercle. In the literature of the subject, however, may be found many similar failures, although the true character of the disease was afterward proved by inoculation,¹ so that Verneuil² classes them as cases of "concealed tuberculosis." The patient now, nearly a year after the operation, has perfect functional use of the foot with no sign of recurrence of the disease.

It is unnecessary to describe affections of bursæ as distinct from those of the tendon-sheaths, except that many of them being superficial, are more liable to injury, with acute inflammation and suppuration. The treatment is similar—rest and compression in the early stage, excision in chronic disease, since, tuberculous or not, it is at any time liable to become so. Volkmann has shown that the fibrinous deposit in these chronic affections is a most favorable nidus for the deposition and growth of the bacillus. The diseased bursa is not essential to the functional use of the tendon, but a source of weakness, at any time liable to acute inflammation.

Enlarged bursæ in connection with tendons, are most often found in the popliteal space, and, as Foucher has demonstrated,³ the bursa of the semi-membranosus muscle is usually affected.

Cysts in this locality, communicating with a diseased knee-joint described by Morant-Baker,⁴ are of little interest in this connection. Corresponding to the subacute inflammation of tendon-sheaths is a similar affection of connective tissue about a tendon. My attention was recently called to this point in the treatment of a boy of

¹ Jalaquier: *L'Union Méd.*, vol. xvii., p. 21. Reynier: *L'Union Méd.*, vol. xvi., p. 895. Terrillon: *L'Union Méd.*, vol. xvi., p. 944. Lucas Championnière.

² *L'Union Méd.*, vol. xvi., p. 944.

³ *Archives Générales de Méd.*, 1856

⁴ *St. Bart. Hosp. Reports*, vols. xiii. and xxi.; and D'Arcy Power: *Trans. of the London Path. Soc.*, vol. xxxvi.

sixteen, suffering from pain and progressive weakness at the wrist, with no previous history of injury.

All that could be made out, was a slight thickening, with local tenderness about the flexor carpi radialis tendon, at the wrist. Palliative treatment was of no avail, but recovery followed promptly after complete confinement of the hand in a metal splint with local compression and stimulation.

Another point of interest in this connection is the local pain and tenderness about the insertion of the tendo Achillis, caused by overwork or the pressure of tight shoes.

Raynal has described the arrangement of the tendon,¹ enclosed with connective tissue between two layers of fascia, and considers the affection a peri-tendonous inflammation, to be treated in the manner already indicated. After rheumatic inflammation of the feet, pain in this locality is often very persistent, and when combined with thickening at the insertion of the tendon, indicates an implication of the bursa, an affection which is extremely chronic in character.

We now come to a more important application of the subject, the relation of the affections of tendon-sheaths and bursæ to diseases and injuries of the joints. I have already indicated the importance of removal of a diseased bursa, which by its liability to acute inflammation is a source of danger, of the tendon-sheaths affected by tuberculous disease, which by extension may set up disease of a similar character in the contiguous joint and have outlined the treatment of the acute and sub-acute inflammations, because the same principles apply to the treatment of secondary affections, the result of sprains and fractures.

The relation of tendon-sheaths to joints explains an important difference in the symptoms of persistent disability in the two joints most often injured, the ankle and knee. In the former, the indications for treatment are almost always outside the joint: pain, local tenderness, and limitation of motion. In the knee, the impor-

¹ Archiv. Gén. de Méd., 1882, p. 677.

tant symptoms are inside the joint : a slight synovitis, a thickening on either side of the ligamentum patellæ, with weakness and insecurity. Again, it is not always the deformity of a badly treated fracture of the wrist that causes the subsequent weakness, for we see cases of extreme deformity with no functional disability but the pain, stiffness, and limitation of motion of the wrist and fingers are the important symptoms. This, we may assume, is the permanent effect of injury on the tissue surrounding the joint, exaggerated in the aged or rheumatic subject.

At the wrist- and ankle-joints, with tendons of great functional activity running directly over and in grooves of the bone, surrounded by synovial sheaths, the effect of the violence which breaks the bone must cause tearing of the sheaths, effusion of blood, and subsequent inflammation of a plastic character. As in fracture of bone the amount of provisional callus thrown out is in inverse proportion to the perfect apposition and retention of the fragments, so the amount of plastic material effused in bruised and torn tendon-sheath must correspond. Yet it is the common practice in the treatment of Colles's fracture, to allow early functional use of these tendons, with the purpose of thus preventing the limitation of motion which so often follows. If we consider the proper treatment of primary affections of bursæ, complete functional rest and local compression, followed by early local massage and stimulation to aid in the absorption of effused products, it will indicate the proper treatment for these secondary affections ; not early functional use, but prolonged functional rest, with early local massage and stimulation.

In old sprains about the ankle, or after fracture, we often find persistent cedema, caused I believe partly by a chronic inflammation of the tissues outside the joint and partly by impaired circulation from loss of functional use. I have, in a former paper,¹ called atten-

¹ Persistent Abduction of the Foot, Commonly Known as Chronic Sprain of the Ankle, New York Medical Journal, October 11, 1890.

tion to the fact that the too early use of an injured ankle or foot causes a voluntary eversion to avoid activity, which finally results in persistent abduction, or limitation of the important movement of adduction. My attention is constantly called to these chronic sprains of the ankle, and to the entire neglect of a proper examination, which would at once show the true condition and indicate the proper remedy. The treatment usually followed in these neglected cases has been to alternate for months blistering and plaster bandages. Now, a plaster bandage applied to a joint which after an old injury is held in improper position, or when its important movements are limited by adhesions and muscular contraction, is useless and improper; but if, under ether, the adhesions are first broken up and the contracted muscles over-stretched, by forcing the foot into a position of extreme adduction or equino varus, then the plaster bandage, which rests and protects the joint, is a most useful appliance. If this preliminary treatment is followed up by massage, support, and muscular exercise, these patients, disabled for months and years, may often be quickly and completely relieved.

The same principle may be applied at the wrist joint, whenever we find an important movement restrained by muscular or fibrous contraction. It is very important that these adhesions should be forcibly broken up, and the over-correction carried to the extreme limit at one operation; gradual stretching seems only to cause pain and to aggravate the previous condition.

The principle of treatment of all these disabilities of joints is the recovery of the normal range of motion, or if that is impossible, to place the joint in the most favorable position for the performance of its function. While in the wrist joint deformity after fracture may often be disregarded, in the ankle it is of the utmost importance that the weight of the body should be transmitted in its normal relation to the foot, so that in deformities following Pott's fracture with functional disability, an osteotomy should always be recommended. In tuberculous disease at the ankle, when restriction of motion is to be ex-

pected, the greatest care should be observed to hold the foot in the line of the leg, and at an absolutely right angle with it.

I have had the opportunity of seeing many of these cases, in which a slight abduction of the foot and shortening of the tendo Achillis were in my opinion the causes of subsequent pain and discomfort; for with an ankylosed ankle, the heel on the ground is the one desideratum, the fore-foot as a weight bearer being regarded as of secondary importance.

In the preparation of this paper, I have collected from the miscellaneous cases applying for treatment at the Hospital for Ruptured and Crippled during the past year, cases of sprains and injuries affecting the joints as follows :

	Adults.	Children.
Recent sprains of the ankle.....	13	2
Chronic " " " ".....	34	11
Disability after fracture at the ankle.....	9	1
Deformity " " " ".....	4	2
	60	16
Total.....		76
Recent injury of the knee.....	7	12
Chronic " " " ".....	56	11
	63	23
Total.....		86
Injury of the hip.....	5	23
Strains of back.....	20	6
Recent sprains of the wrist.....	7	..
Chronic " " " ".....	6	..
Fracture of wrist with deformity.....	7	2
Sprains of the elbow.....	3	2
" " shoulder.....	11	2

In these cases are not included recent or old fractures of the elbow, shoulder, or of the patella, as they do not directly interest us in this connection. It will be noted that of the 190 injured joints of the lower extremity, 128 were adults, and 62 children; of the 50 injuries of the upper extremity, 44 were adults and but 6 children.

We may assume that the great preponderance of injury of the lower over the upper extremities has a direct bearing on the relative frequency of tuberculous disease in the two localities.

The importance of careful treatment of slight injuries is emphasized by the recent experiments of Krause,¹ who found that it was often possible to produce local tuberculosis in previously inoculated animals by spraining joints; while severe injuries, fractures and the like, healed in a normal manner. In children, from their greater susceptibility to tuberculous infection, injury of a joint is a much more serious matter than in the adult. Children recover so quickly from injury that one of the most important diagnostic points in any suspicious case is chronicity, no matter what the symptoms may be.

I regret that my time does not allow me to pay particular attention to some of the points of interest in the diagnosis and treatment of the various affections that have been mentioned.

I have endeavored to call your attention to the importance of careful treatment of joint injuries, in the first instance, and to indicate the principles of treatment in chronic and neglected cases; to the importance of local treatment after severe injuries and fractures, and to the necessity of early excision of all chronic and suspicious enlargements of bursæ and tendon-sheaths.

The study of these chronic joint affections is very instructive; it teaches the importance of an accurate knowledge of the functions and anatomical peculiarities of normal joints, and as affected by injury and disease; what is to be avoided and guarded against in the acute stage; and in neglected cases the importance of treatment conducted with an object, as opposed to the routine application of remedies on general principles.

¹ Diseases of Bones and Joints, Wood's Monographs, July, 1881.

